

FORUM NOKIA

MIDI in Nokia Phones

Version 1.3; April 14, 2003

Messaging

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14 April 03	V1.3	The Nokia 3300, 6220, and some miscellaneous composing instructions added.

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MIDI in Nokia Phones

Version 1.3; April 14, 2003

1 MIDI in General

Musical Instrument Digital Interface (MIDI) enables polyphonic musical compositions with a wide variety of different sounds. This means that multiple tones can be played at the same time using predefined instrument sounds such as piano, guitar, violin, drums, etc.

2 MIDI in Nokia Products

Nokia 3300, 3510(i), 3650, 5100, 6100, 6220, 6610, 6650, 6800, 7210, 7250, and 7650 [1] are the Nokia phones supporting MIDI tones [2]. MIDI tones can be used as ring tones, message alert tones, and in games as background music and sound effects.

2.1 MIDI Characteristics in the Nokia 3510(i), 5100, 6100, 6220, 6610, 6800, 7210, and 7250

- Wavetable sound synthesis technology with sampled sounds from real instruments
- Playback support for polyphony level 4 MIDI content (playback of four simultaneous notes). The Nokia 6220 has playback support for polyphony level up to 16 (playback of 16 simultaneous notes).
- Scalable Polyphony MIDI (SP-MIDI) content is supported in Standard MIDI File (SMF) format [5] according to the SP-MIDI specification [3] and the profile specification [4] (at polyphony level 4 and in the Nokia 6220 at polyphony level up to 16).
- Instrument bank implementation supports General MIDI level 1 (GM1) [6] using a mapping scheme for similar timbres using 29 melodic and 14 percussive instruments. The instrument bank mapping is defined in **Table 1a**, **1b**, **1c**, and **Table 2**.
- Total size of memory for downloaded MIDI content 40 – 110 kB
- Vibra control messages available in SP-MIDI format
- MIDI download over MMS or WAP (see Section 2.4)
- Supported MIME types:
 - Audio/midi
 - Audio/sp-midi (not in the Nokia 3510)

2.2 MIDI Characteristics in the Nokia 3650 and 7650

- Wavetable sound synthesis technology with sampled sounds from real instruments
- Playback support for polyphony 24 MIDI content
- SP-MIDI and GM1 content in SMF format
- Instrument bank according to GM1 standard with 128 melodic and 47 percussive instruments. The instrument bank mapping is also illustrated in **Table 1a, 1b, 1c**, and **Table 2**.
- MIDI download over MMS or WAP (see Section 2.4)
- Vibra control messages of SP-MIDI are not supported
- Supported MIME types:
 - Audio/midi
 - Audio/sp-midi

2.3 MIDI Characteristics in the Nokia 3300 and 6650

- Wavetable sound synthesis technology with sampled sounds from real instruments
- Playback support for polyphony 24 MIDI content
- Maximum MIDI file size is 62 kB in the Nokia 3300 and 128 kB in the Nokia 6650
- SP-MIDI and GM1 content in SMF format
- Instrument bank according to GM1 standard with 128 melodic and 47 percussive instruments. The instrument bank mapping is also illustrated in **Table 1a, 1b, 1c**, and **Table 2**.
- MIDI download over MMS or WAP (see Section 2.4)
- Vibra control messages available in SP-MIDI format
- Supported MIME types:
 - Audio/midi
 - Audio/sp-midi

2.4 Download Methods for MIDI Content

Traditional ring tones in Nokia phones are downloaded to the phone as smart messages. This procedure is not possible with the new polyphonic MIDI tones. There are currently two ways to download MIDI ring tones to the phone.

1. MIDI download over MMS

- The end user sends a normal SMS message with a keyword to some content provider's service number and receives an MMS message containing the requested MIDI tone. The user can play the tone and save it in the ring tones directory of the phone.

2. MIDI download over WAP

- The end user uses a content provider's WAP services to download MIDI tones. It is recommended to use Content Download or OMA Download to download MIDI tones to Nokia MIDI enabled devices. More information about Content Download and OMA Download can be found at <http://www.forum.nokia.com/main.html> (DRM and Download).

The downloaded SP-MIDI files cannot be sent to another phone due to SP-MIDI content policy restrictions based on Digital Rights Management (DRM).

3 MIDI Content Creation Principles

3.1 What Is Scalable Polyphony MIDI (SP-MIDI)?

SP-MIDI is a novel enhancement to the MIDI format that makes it particularly suitable for mobile devices. Basic knowledge of MIDI is needed for a proper understanding of SP-MIDI content creation. MIDI information can be obtained from several books, and official MIDI information and specifications are available from the MIDI Manufacturer's Association (MMA) [7]. For more information, visit the MMA Web site at <http://www.midi.org>.

SP-MIDI shares many similarities with other MIDI specifications, thus it is rather easy to learn SP-MIDI based on previous knowledge of other formats. SP-MIDI functionality is implemented using a new MIDI message called the Maximum Instantaneous Polyphony (MIP) message. The MIP message is used to define the musical arrangement of the SP-MIDI content according to the desired polyphony levels.

SP-MIDI also can be understood as a layered representation of the MIDI music, where MIDI channels are ordered according to channel priority and the polyphony level is defined as a cumulative playback requirement starting from the highest priority channels. For example, if the channel priority order is {10,3,7,2,1,...}, the polyphony level would be defined for the following channel groups: {10, 10 & 3, 10 & 3 & 7, 10 & 3 & 7 & 2, 10 & 3 & 7 & 2 & 1, etc.}. The corresponding polyphony levels are also included in the MIP message.

By combining the channel priority order information and the polyphony level information in the MIP message, the composer can instruct SP-MIDI synthesizers to play the correct set of MIDI channels that do not exceed the playback capabilities of the SP-MIDI player (synthesizer). Since SP-MIDI players can have different capabilities of playing polyphonic music (e.g., 4 or 24), MIP messages can be used efficiently to define which channels the player should play and neglect the others. When the MIP messages are set properly, disturbing note-stealing effects (termination of sounding notes) can be avoided.

The SP-MIDI specification is maintained by the MMA [7]. Both the SP-MIDI specification [3] and the device profile document [4] are available through the MMA Web site.

3.2 How SP-MIDI Should Be Composed

MIDI songs are normally composed using sequencer programs. The user interfaces of these programs consist of several horizontal tracks that can contain MIDI music for one or many channels. However, it is recommended that only one channel be used per track. This simplifies composition work, because tracks can be arranged according to the channel priority order in the program.

SP-MIDI supports two percussion (drum) channels, Channel 10 (default) and Channel 11, which defaults to a melodic channel but can be switched to a percussion channel using the following messages:

1. Bank select message (Control Change #0) with Bank# MSB value 120 (78H)
2. Bank select message (Control Change #32) with value Bank# LSB 0 (00H)
3. Program Change message with value 1 (00H)

The channel can be changed back to a melody channel by repeating the same procedure — by giving the Bank Change MSB value 121 (79H) instead of 120 (78H) and setting the desired instrument for Program Change value.

When composing or modifying MIDI songs, the following recommendations should be considered:

- SP-MIDI content is recognized from the MIP message. The MIP message should be placed in the beginning of the MIDI song, i.e., the MIP message should be the first message of the MIDI song (delta-time 00). The first MIP message is used to initialize the SP-MIDI player to the SP-MIDI playback mode, but also for file-type recognition using a following Magic number(s) in octets:
- First four bytes (1-4): \115\124\150\144,
byte (24):\360,
byte (26):\177,
bytes (28-29):\013\001

The lead melody should be kept monophonic if possible, so that the song can also be converted to an SMS ring tone or to other monophonic melody formats. This is not always relevant, but in many cases it is possible to separate the monophonic melody from the original polyphonic melody and, in this way, divide the polyphonic melody on multiple channels.

- The lead melody should be at the topmost track of the UI. The lead melody is usually the most important element of a song, so placing its track topmost in the UI is a reminder of its priority. The second-most-important instrument track should be placed below it, etc., so that the MIDI channels used are in order of priority.
- A proper instrument for the track must be set before the first Note On message on the channel (preferably at the very beginning of the used track). Instruments can be set using normal Program Change messages. It is useful to know that the instrument map for the Nokia 3510(i), 5100, 6100, 6220, 6610, 6800, 7210, and 7250 synthesizer supports GM1 sound bank by mapping some of the instruments to other instruments with similar timbral characteristics. This is a rather common trick for optimizing memory usage between different instruments in the instrument bank. A detailed definition of the instrument mapping is provided in **Table 1a**, **1b**, **1c**, and **Table 2**.
- MIP value indicates the simultaneous polyphony of channels, so it is not the sum of the polyphonies of individual channels (see Figure 1).

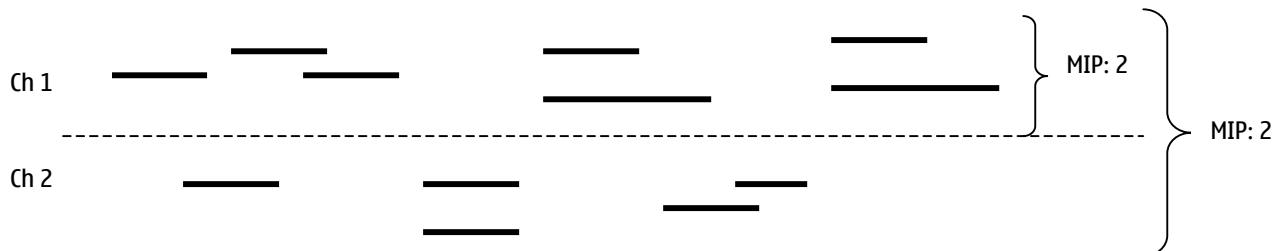


Figure 1. An example of a simple MIP value analysis

Figure 1 shows an example of a simple MIP value analysis. Two channels are used in the song, Ch1 and Ch2, with Ch1 having higher priority. The black lines represent single notes and time advances from left to right. If the polyphony level of the individual channels is considered, in both cases the polyphony is 2. If the polyphony requirement for playing these two channels simultaneously is considered, the polyphony is still 2 because there are no more than two notes playing at the time. Thus, the MIP value of the higher priority channel is 2, but the same MIP value should also be applied for these two channels together.

It is worth noting that the MIP value is counted based on the number of currently playing sounds, taking into account the release time after the note has ended, and also the fact that percussion sounds are always played from the beginning to the end regardless of the note duration.

- The Nokia 3510(i), 5100, 6100, 6610, 6800, 7210, and 7250 support SP-MIDI with polyphony levels up to 4 and the Nokia 6220 supports SP-MIDI with polyphony levels up to 16, while the Nokia 3300, 3650, 6650, and 7650 support polyphony levels up to 24. To optimize the content for all of these models, it is recommended that developers use the SP-MIDI format. The song should be

composed so that the song contains a channel with a MIP value equal to 4 or less. In fact, the Nokia 3510(i), 5100, 6100, 6610, 6800, 7210, and 7250 models do not play SP-MIDI songs where the highest priority channel has a MIP value of 5 or more. Similarly, the Nokia 6220 will not play an SP-MIDI song where the highest priority channel is assigned a MIP value of more than 16, and the Nokia 3300, 3650, 6650, and 7650 will not play an SP-MIDI song where the highest priority channel is assigned a MIP value of more than 24.

3.3 Miscellaneous MIDI Composing Instructions

- It is recommended that a brief rest be inserted between the control messages and the first notes in the beginning of the MIDI file. This will allow the MIDI synthesizer to apply all of the parameter settings before the song actually begins. The exact rest duration required to apply the settings will depend on the number of control messages used and may also vary depending on the phone model. In practice, a rest duration of 100 ms will suffice in most cases, hence a sixteenth rest or an eighth rest should be inserted for a typical song tempo of 120 bpm. When designing MIDI ring tones, it is important to keep the rest duration as short as possible to avoid delays in the start and repetition of the ring-tone playback. The shortest possible duration can be confirmed by downloading the composed MIDI file to the phone and playing it back.
- Depending on the phone device capabilities, it may happen that the composed song cannot be played back in the target device. A typical cause for this is that the song uses more MIDI instruments than the device can store for the song playback. The composer should experiment to find a set of instruments that will fit to the device memory, enabling the song to be played back.
- When composing MIDI files in SMF 1 format, i.e., using multiple tracks, it is worth noting that the MIDI players in Nokia's products are capable of playing SMF files containing up to 65 different tracks.

3.4 Designing MIDI Tones for Proper Volume

In order to attract the user's attention, ring tones need to be audible in noisy mobile environments. Therefore, ring tones must be optimized for volume in the design phase. Here are some suggestions for achieving this goal:

1. The channel volume for the strongest instrument should be set at the maximum (127). The default volume in the phones is set at 127. It is recommended that developers avoid using the master volume control in files containing MIDI tones, as this setting is intended for device-level purposes.
2. Small phone speakers have a relatively narrow frequency bandwidth. Ring tones should include a lot of frequencies that are within the strong area of the small speakers. This can be achieved, for example, by transposing the lead melody appropriately. It is recommended that developers test the ring tones on the target phone.
3. The notes in the arrangement can be doubled or tripled (using the same instrument and the same note number), especially in high-polyphony versions. This technique seems to help with quieter instruments, such as bass and drums.
4. Sometimes compromises must be made between aesthetics and audibility. For example, an oboe simply sounds louder than a flute through a small speaker.

4 MIDI Vibra Alert Control

The SP-MIDI standard [4] defines an optional method for vibra alert control using MIDI messages. SP-MIDI content can be composed having synchronized audio and vibra performance. This feature is supported in the Nokia 3300, 3510(i), 5100, 6100, 6220, 6610, 6650, 6800, 7210, and 7250 devices. Vibra control is defined as a melodic MIDI instrument. The vibra control is supported on a melody channel using the following instrument bank and program numbers:

PROG#	BANK# (MSB LSB)	PROGRAM NAME	Recommended key range (in Nokia 3300, 3510(i), 5100, 6100, 6220, 6610, 6650, 6800, 7210, 7250)
### SFX			
125 (7CH)	79H 06H	Vibra	50

In the Nokia 3300, 3510(i), 5100, 6100, 6220, 6610, 6650, 6800, 7210, and 7250 implementation, the Note On message turns vibra on and the Note Off message turns vibra off. Vibra channel is monophonic and only one note can be rendered at a time. Composers should use the following values for Note On messages: Note# = 50 and Velocity = 100.

Vibra information must be composed on one melodic MIDI channel. Vibra program selection is done using a sequence of three consecutive messages on a single channel:

1. Bank select message (Control Change #0) with value Bank# MSB 121 (79H)
2. Bank select message (Control Change #32) with value Bank# LSB 6 (06H)
3. Program Change message with value (Prog#) 125 (7CH)

In SP-MIDI, all channels have defined channel priority. To ensure that vibra is always played (at all polyphony levels), vibra channel should have a high channel priority. Since vibra support does not reserve any voices from the MIDI synthesizer, vibra notes should not be taken into consideration in the actual MIP calculation.

The following is a simple procedure for creating SP-MIDI content with vibra information that is supported at all polyphony levels:

1. Compose SP-MIDI content and generate the MIP message
2. Add vibra information on one free channel
3. Modify the MIP message by a) setting the vibra channel to be the second highest priority channel, and b) copying the MIP value of the highest (first) priority channel for the vibra channel

5 Instrument Bank

The following table includes the instrument bank implemented for the Nokia 3510, 3510i, 5100, 6100, 6220, 6610, 6800, 7210 and 7250 devices as well as for the Nokia 3300, 3650, 6650, and 7650

synthesizers. The Nokia 3300, 3650, 6650, and 7650 phones support the full General MIDI level 1 sound set. More information about instrument mapping standards can be found in reference [7].

Table 1a: Melodic Instrument Map in Nokia MIDI Products

Prog#	Bank # (MSB LSB)	Instrument (GM1 Instrument Map)	Instrument Map (Nokia 3510(i),5100,6100, 6220,6610,6800,7210,7250)	Instrument Map (Nokia 3300,3650,6650, 7650)
1 (00H)	79H 00H	Acoustic Grand Piano	Acoustic Grand Piano	Acoustic Grand Piano
2 (01H)	79H 00H	Bright Acoustic Piano	Acoustic Grand Piano	Bright Acoustic Piano
3 (02H)	79H 00H	Electric Grand Piano	Acoustic Grand Piano	Electric Grand Piano
4 (03H)	79H 00H	Honky-tonk Piano	Acoustic Grand Piano	Honky-tonk Piano
5 (04H)	79H 00H	Electric Piano 1	Acoustic Grand Piano	Electric Piano 1
6 (05H)	79H 00H	Electric Piano 2	Acoustic Grand Piano	Electric Piano 2
7 (06H)	79H 00H	Harpsichord	Acoustic Grand Piano	Harpsichord
8 (07H)	79H 00H	Clavi	Acoustic Grand Piano	Clavi
9 (08H)	79H 00H	Celesta	Acoustic Grand Piano	Celesta
10 (09H)	79H 00H	Glockenspiel	Glockenspiel	Glockenspiel
11 (0AH)	79H 00H	Music box	Glockenspiel	Music box
12 (0BH)	79H 00H	Vibraphone	Vibraphone	Vibraphone
13 (0CH)	79H 00H	Marimba	Marimba	Marimba
14 (0DH)	79H 00H	Xylophone	Marimba	Xylophone
15 (0EH)	79H 00H	Tubular Bells	Glockenspiel	Tubular Bells
16 (0FH)	79H 00H	Dulcimer	Vibraphone	Dulcimer
17 (10H)	79H 00H	Drawbar Organ	Drawbar Organ	Drawbar Organ
18 (11H)	79H 00H	Percussive Organ	Drawbar Organ	Percussive Organ
19 (12H)	79H 00H	Rock Organ	Drawbar Organ	Rock Organ
20 (13H)	79H 00H	Church Organ	Drawbar Organ	Church Organ
21 (14H)	79H 00H	Reed Organ	Drawbar Organ	Reed Organ
22 (15H)	79H 00H	Accordion	Drawbar Organ	Accordion
23 (16H)	79H 00H	Harmonica	Drawbar Organ	Harmonica
24 (17H)	79H 00H	Tango Accordion	Drawbar Organ	Tango Accordion
25 (18H)	79H 00H	Acoustic Guitar (nylon)	Electric Guitar (clean)	Acoustic Guitar (nylon)
26 (19H)	79H 00H	Acoustic Guitar (steel)	Electric Guitar (clean)	Acoustic Guitar (steel)
27 (1AH)	79H 00H	Electric Guitar (jazz)	Electric Guitar (clean)	Electric Guitar (jazz)
28 (1BH)	79H 00H	Electric Guitar (clean)	Electric Guitar (clean)	Electric Guitar (clean)
29 (1CH)	79H 00H	Electric Guitar (muted)	Electric Guitar (clean)	Electric Guitar (muted)
30 (1DH)	79H 00H	Overdriven Guitar	Electric Guitar (clean)	Overdriven Guitar
31 (1EH)	79H 00H	Distortion Guitar	Electric Guitar (clean)	Distortion Guitar
32 (1FH)	79H 00H	Guitar Harmonics	Electric Guitar (clean)	Guitar Harmonics
33 (20H)	79H 00H	Acoustic Bass	Electric Bass (finger)	Acoustic Bass
34 (21H)	79H 00H	Electric Bass (finger)	Electric Bass (finger)	Electric Bass (finger)
35 (22H)	79H 00H	Electric Bass (pick)	Electric Bass (finger)	Electric Bass (pick)
36 (23H)	79H 00H	Fretless Bass	Electric Bass (finger)	Fretless Bass
37 (24H)	79H 00H	Slap Bass 1	Electric Bass (finger)	Slap Bass 1
38 (25H)	79H 00H	Slap Bass 2	Electric Bass (finger)	Slap Bass 2
39 (26H)	79H 00H	Synth Bass 1	Electric Bass (finger)	Synth Bass 1
40 (27H)	79H 00H	Synth Bass 2	Electric Bass (finger)	Synth Bass 2
41 (28H)	79H 00H	Violin	Violin	Violin
42 (29H)	79H 00H	Viola	Violin	Viola
43 (2AH)	79H 00H	Cello	Violin	Cello
44 (2BH)	79H 00H	Contrabass	Violin	Contrabass

Table 1b: Melodic Instrument Map in Nokia MIDI Products

Prog#	Bank # (MSB LSB)	Instrument (GM1 Instrument Map)	Instrument Map (Nokia 3510(i),5100,6100,6220, 6610,6800,7210,7250)	Instrument Map (Nokia 3300,3650,6650,7650)
45 (2CH)	79H 00H	Tremolo Strings	String Ensemble 1	Tremolo Strings
46 (2DH)	79H 00H	Pizzicato Strings	Marimba	Pizzicato Strings
47 (2EH)	79H 00H	Orchestral Harp	Glockenspiel	Orchestral Harp
48 (2FH)	79H 00H	Timpani	Steel Drums	Timpani
49 (30H)	79H 00H	String Ensemble 1	String Ensemble 1	String Ensemble 1
50 (31H)	79H 00H	String Ensemble 2	String Ensemble 2	String Ensemble 2
51 (32H)	79H 00H	SynthStrings 1	String Ensemble 2	SynthStrings 1
52 (33H)	79H 00H	SynthStrings 2	String Ensemble 2	SynthStrings 2
53 (34H)	79H 00H	Choir Aahs	Pad 2 (warm)	Choir Aahs
54 (35H)	79H 00H	Voice Oohs	Pad 2 (warm)	Voice Oohs
55 (36H)	79H 00H	Synth Voice	Pad 2 (warm)	Synth Voice
56 (37H)	79H 00H	Orchestra Hit	Steel Drums	Orchestra Hit
57 (38H)	79H 00H	Trumpet	Trumpet	Trumpet
58 (39H)	79H 00H	Trombone	Trumpet	Trombone
59 (3AH)	79H 00H	Tuba	Trumpet	Tuba
60 (3BH)	79H 00H	Muted Trumpet	Trumpet	Muted Trumpet
61 (3CH)	79H 00H	French Horn	Trumpet	French Horn
62 (3DH)	79H 00H	Brass Section	Trumpet	Brass Section
63 (3EH)	79H 00H	SynthBrass 1	Trumpet	SynthBrass 1
64 (3FH)	79H 00H	SynthBrass 2	Trumpet	SynthBrass 2
65 (40H)	79H 00H	Soprano Sax	Tenor Sax	Soprano Sax
66 (41H)	79H 00H	Alto Sax	Tenor Sax	Alto Sax
67 (42H)	79H 00H	Tenor Sax	Tenor Sax	Tenor Sax
68 (43H)	79H 00H	Baritone Sax	Tenor Sax	Baritone Sax
69 (44H)	79H 00H	Oboe	Tenor Sax	Oboe
70 (45H)	79H 00H	English Horn	Tenor Sax	English Horn
71 (46H)	79H 00H	Bassoon	Tenor Sax	Bassoon
72 (47H)	79H 00H	Clarinet	Tenor Sax	Clarinet
73 (48H)	79H 00H	Piccolo	Flute	Piccolo
74 (49H)	79H 00H	Flute	Flute	Flute
75 (4AH)	79H 00H	Recorder	Whistle	Recorder
76 (4BH)	79H 00H	Pan Flute	Flute	Pan Flute
77 (4CH)	79H 00H	Blown Bottle	Flute	Blown Bottle
78 (4DH)	79H 00H	Shakuhachi	Flute	Shakuhachi
79 (4EH)	79H 00H	Whistle	Whistle	Whistle
80 (4FH)	79H 00H	Ocarina	Whistle	Ocarina
81 (50H)	79H 00H	Lead 1 (square)	Lead 2 (sawtooth)	Lead 1 (square)
82 (51H)	79H 00H	Lead 2 (sawtooth)	Lead 2 (sawtooth)	Lead 2 (sawtooth)
83 (52H)	79H 00H	Lead 3 (calliope)	Lead 2 (sawtooth)	Lead 3 (calliope)
84 (53H)	79H 00H	Lead 4 (chiff)	Lead 2 (sawtooth)	Lead 4 (chiff)
85 (54H)	79H 00H	Lead 5 (charang)	Lead 2 (sawtooth)	Lead 5 (charang)
86 (55H)	79H 00H	Lead 6 (voice)	Lead 2 (sawtooth)	Lead 6 (voice)
87 (56H)	79H 00H	Lead 7 (fifths)	Lead 2 (sawtooth)	Lead 7 (fifths)
88 (57H)	79H 00H	Lead 8 (bass+lead)	Lead 2 (sawtooth)	Lead 8 (bass+lead)
89 (58H)	79H 00H	Pad 1 (new age)	Pad 2 (warm)	Pad 1 (new age)
90 (59H)	79H 00H	Pad 2 (warm)	Pad 2 (warm)	Pad 2 (warm)

Table 1c: Melodic Instrument Map in Nokia MIDI Products

Prog#	Bank # (MSB LSB)	Instrument (GM1 Instrument Map)	Instrument Map (Nokia 3510(i),5100,6100, 6220,6610,6800,7210,7250)	Instrument Map (Nokia 3300,3650,6650, 7650)
91 (5AH)	79H 00H	Pad 3 (polysynth)	FX 4 (atmosphere)	Pad 3 (polysynth)
92 (5BH)	79H 00H	Pad 4 (choir)	Pad 2 (warm)	Pad 4 (choir)
93 (5CH)	79H 00H	Pad 5 (bowed)	Pad 2 (warm)	Pad 5 (bowed)
94 (5DH)	79H 00H	Pad 6 (metallic)	Pad 2 (warm)	Pad 6 (metallic)
95 (5EH)	79H 00H	Pad 7 (halo)	Pad 2 (warm)	Pad 7 (halo)
96 (5FH)	79H 00H	Pad 8 (sweep)	Pad 2 (warm)	Pad 8 (sweep)
97 (60H)	79H 00H	FX 1 (rain)	Pad 2 (warm)	FX 1 (rain)
98 (61H)	79H 00H	FX 2 (soundtrack)	Pad 2 (warm)	FX 2 (soundtrack)
99 (62H)	79H 00H	FX 3 (crystal)	Glockenspiel	FX 3 (crystal)
100 (63H)	79H 00H	FX 4 (atmosphere)	FX 4 (atmosphere)	FX 4 (atmosphere)
101 (64H)	79H 00H	FX 5 (brightness)	FX 4 (atmosphere)	FX 5 (brightness)
102 (65H)	79H 00H	FX 6 (goblins)	Pad 2 (warm)	FX 6 (goblins)
103 (66H)	79H 00H	FX 7 (echoes)	Pad 2 (warm)	FX 7 (echoes)
104 (67H)	79H 00H	FX 8 (sci-fi)	FX 4 (atmosphere)	FX 8 (sci-fi)
105 (68H)	79H 00H	Sitar	Electric Guitar (clean)	Sitar
106 (69H)	79H 00H	Banjo	Electric Guitar (clean)	Banjo
107 (6AH)	79H 00H	Shamisen	Electric Guitar (clean)	Shamisen
108 (6BH)	79H 00H	Koto	Electric Guitar (clean)	Koto
109 (6CH)	79H 00H	Kalimba	Marimba	Kalimba
110 (6DH)	79H 00H	Bag Pipe	Drawbar Organ	Bag Pipe
111 (6EH)	79H 00H	Fiddle	Violin	Fiddle
112 (6FH)	79H 00H	Shanai	Tenor Sax	Shanai
113 (70H)	79H 00H	Tinkle Bell	Steel Drums	Tinkle Bell
114 (71H)	79H 00H	Agogo	Woodblock	Agogo
115 (72H)	79H 00H	Steel Drums	Steel Drums	Steel Drums
116 (73H)	79H 00H	Woodblock	Woodblock	Woodblock
117 (74H)	79H 00H	Taiko Drum	Melodic Tom	Taiko Drum
118 (75H)	79H 00H	Melodic Tom	Melodic Tom	Melodic Tom
119 (76H)	79H 00H	Synth Drum	Melodic Tom	Synth Drum
120 (77H)	79H 00H	Reverse Cymbal	Reverse Cymbal	Reverse Cymbal
121 (78H)	79H 00H	Guitar Fret Noise	Guitar Fret Noise	Guitar Fret Noise
122 (79H)	79H 00H	Breath Noise	Breath Noise	Breath Noise
123 (7AH)	79H 00H	Seashore	Seashore	Seashore
124 (7BH)	79H 00H	Bird Tweet	Bird Tweet	Bird Tweet
125 (7CH)	79H 00H	Telephone Ring	Telephone Ring	Telephone Ring
126 (7DH)	79H 00H	Helicopter	Helicopter	Helicopter
127 (7EH)	79H 00H	Applause	Applause	Applause
128 (7FH)	79H 00H	Gunshot	Gunshot	Gunshot

Table 2: Percussion Instrument Map in Nokia MIDI Products

Key#	Instrument (GM1 Percussion Map)	Patch Map (Nokia 3510(i),5100,6100,6220,6610, 6800,7210,7250)	Patch Map (Nokia 3300,3650,6650, 7650)
35	Acoustic Bass Drum	Bass Drum 1	Acoustic Bass Drum
36	Bass Drum 1	Bass Drum 1	Bass Drum 1
37	Side Stick	Claves	Side Stick
38	Acoustic Snare	Electric Snare	Acoustic Snare
39	Hand Clap	Low Tom	Hand Clap
40	Electric Snare	Electric Snare	Electric Snare
41	Low Floor Tom	Low Tom	Low Floor Tom
42	Closed Hi Hat	Closed Hi Hat	Closed Hi Hat
43	High Floor Tom	Low Tom	High Floor Tom
44	Pedal Hi-Hat	Closed Hi Hat	Pedal Hi-Hat
45	Low Tom	Low Tom	Low Tom
46	Open Hi-Hat	Open Hi-Hat	Open Hi-Hat
47	Low-Mid Tom	Hi Mid Tom	Low-Mid Tom
48	Hi Mid Tom	Hi Mid Tom	Hi Mid Tom
49	Crash Cymbal 1	Crash Cymbal 1	Crash Cymbal 1
50	High Tom	Hi Mid Tom	High Tom
51	Ride Cymbal 1	Ride Cymbal 1	Ride Cymbal 1
52	Chinese Cymbal	Ride Cymbal 1	Chinese Cymbal
53	Ride Bell	Ride Cymbal 1	Ride Bell
54	Tambourine	Tambourine	Tambourine
55	Spash Cymbal	Open Hi-Hat	Spash Cymbal
56	Cowbell	Claves	Cowbell
57	Crash Cymbal 2	Crash Cymbal 2	Crash Cymbal 2
58	Vibraslap	Open Hi-Hat	Vibraslap
59	Ride Cymbal 2	Ride Cymbal 1	Ride Cymbal 2
60	Hi Bongo	Mute Hi Conga	Hi Bongo
61	Low Bongo	Low Conga	Low Bongo
62	Mute Hi Conga	Mute Hi Conga	Mute Hi Conga
63	Open Hi Conga	Low Conga	Open Hi Conga
64	Low Conga	Low Conga	Low Conga
65	High Timbale	Mute Hi Conga	High Timbale
66	Low Timbale	Low Conga	Low Timbale
67	High Agogo	Mute Hi Conga	High Agogo
68	Low Agogo	Low Conga	Low Agogo
69	Cabasa	Maracas	Cabasa
70	Maracas	Maracas	Maracas
71	Short Whistle	Closed Hi Hat	Short Whistle
72	Long Whistle	Open Hi-Hat	Long Whistle
73	Short Guiro	Maracas	Short Guiro
74	Long Guiro	Open Hi-Hat	Long Guiro
75	Claves	Claves	Claves
76	Hi Wood Block	Claves	Hi Wood Block
77	Low Wood Block	Claves	Low Wood Block
78	Mute Cuica	Mute Hi Conga	Mute Cuica
79	Open Cuica	Low Conga	Open Cuica
80	Mute Triangle	Closed Hi Hat	Mute Triangle
81	Open Triangle	Maracas	Open Triangle

6 Terms and Abbreviations

Term or Abbreviation	Description
DRM	Digital Rights Management
MIDI	Musical Instrument Digital Interface
MIP	Maximum Instantaneous Polyphony
MMA	MIDI Manufacturer's Association
MMS	Multimedia Messaging Service
SMS	Scalable Polyphony MIDI
WAP	Wireless Application Protocol

7 References

- [1] Products section of the Nokia Web site, <http://www.nokia.com>.
- [2] *MIDI 1.0 Detailed Specification*. Version 4.2, February 1996, In “The Complete MIDI 1.0 Detailed Specification, Document Version 96.1.” The MIDI Manufacturers Association, Los Angeles, CA, USA.
- [3] *Scalable Polyphony MIDI Specification*. Version 1.0, RP-034, February 2002, The MIDI Manufacturers Association, Los Angeles, CA, USA.
- [4] *Scalable Polyphony MIDI Device 5-24 Note Profile for 3GPP*. December 2001, R-035, The MIDI Manufacturers Association, Los Angeles, CA, USA.
- [5] *Standard MIDI Files 1.0*. February 1996, RP-001, In “The Complete MIDI 1.0 Detailed Specification, Document Version 96.1.” The MIDI Manufacturers Association, Los Angeles, CA, USA.
- [6] *General MIDI System Level 1*. 1994, RP-003, In “The Complete MIDI 1.0 Detailed Specification, Document Version 96.1.” The MIDI Manufacturers Association, Los Angeles, CA, USA.
- [7] The MIDI Manufacturers Association, <http://www.midi.org>.

Appendix: MIDI Implementation Charts

MIDI Implementation Chart for the Nokia 3300, 3510, 3510i, 5100, 6100, 6220, 6610, 6650, 6800, 7210, and 7250 products and MIDI Implementation Chart for the Nokia 3650 and 7650 products

Nokia Products: 3300, 3510(i), 5100, 6100,
6610, 6650, 6800, 7210, 7250

MIDI Implementation Chart

Date: April 14, 2003
Version: 1.3

Function		Transmitted ⁽¹⁾	Recognized	Remarks
BASIC CHANNEL			1 - 16 1 - 16	
Mode			Mode 3 X	
Note Number		*****	0 - 127	
Velocity			0 X	
After Touch			X 0	
Pitch Bend			0	
Control Change ⁽²⁾			0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Bank Select (MSB, LSB) Modulation Depth Channel Volume Expression Hold 1 (Damper) Data Entry RPN (MSB, LSB) ⁽⁴⁾ All Sound Off Reset All Controllers All Notes Off
Program Change		*****	0 0 - 127	
System Exclusive			0 0 0 0	
System Common			X X X	
System Real Time			X X	
Aux Messages			X 0 X X	
Notes		<p>(1) Device does not have MIDI output and hence it does not transmit any MIDI messages. (2) Controllers that are not mentioned here are not supported. (3) (MSB, LSB) = 0, 32 is supported only for SP-MIDI playback. Only (MSB) is supported for other MIDI content. (4) MSB, LSB = 0, 0 (Pitch Bend Sensitivity, default +/-2 semitones, range +/-24 semitones); 127, 127 (RPN NULL) (5) GM2 System On message is supported for the reset of SP-MIDI playback mode. GM2 system is not supported.</p>		

Mode 1: OMNI ON, POLY
Mode 3: OMNI OFF, POLY

Mode 2: OMNI ON, MONO
Mode 4: OMNI OFF, MONO

O : Yes
X : No

Nokia Products:
3650, 7650

MIDI Implementation Chart

Date: Nov 18, 2002
Version: 1.1

Function	Transmitted ⁽¹⁾	Recognized	Remarks
Basic Channel Default Changed		1 – 16 1 – 16	
Mode Default Messages Altered	*****	Mode 3 X	
Note Number True Voice	*****	0 – 127 0 – 127	
Velocity Note On Note Off		0 X	
After Touch Key's Channel		X 0	
Pitch Bend		0	
Control Change⁽²⁾ 0, 32 ⁽³⁾ 1 7 11 64 6,38 100, 101 121 123		0 0 0 0 0 0 0 0 0	Bank Select (MSB, LSB) Modulation Volume Expression Hold 1 (Sustain) Data Entry RPN (MSB, LSB) ⁽⁴⁾ Reset All Controllers All Notes Off
Program Change True Number	*****	0 0 – 127	
System Exclusive Master Volume MIP Message GM2 System On ⁽⁵⁾ GM1 System On		0 0 0 0	
System Common Song Position Song Select Tune Request		X X X	
System Real Time Clock Commands		X X	
Aux Messages Local On/Off All Notes Off Active Sensing System Reset		X 0 X X	
Notes	<p>⁽¹⁾ Device does not have MIDI output and hence it does not transmit any MIDI messages.</p> <p>⁽²⁾ Controllers that are not mentioned here are not supported.</p> <p>⁽³⁾ (MSB, LSB) = 0, 32 is supported only for SP-MIDI playback. Only (MSB) is supported for other MIDI content.</p> <p>⁽⁴⁾ (MSB, LSB) = 0, 0 (Pitch Bend Sensitivity, default +/-2 semitones, range +/-24 semitones); 127, 127 (RPN NULL)</p> <p>⁽⁵⁾ GM2 System On message is supported for the reset of SP-MIDI playback mode. GM2 system is not supported.</p>		

Mode 1: OMNI ON, POLY
Mode 3: OMNI OFF, POLY

Mode 2: OMNI ON, MONO
Mode 4: OMNI OFF, MONO

0 : Yes
X : No

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